10EC64

Sixth Semester B.E. Degree Examination, July/August 2021
Antennas and Propagation

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Define the terms related to antenna theory,
   i) Effective height ii) Antenna efficiency ii) Directivity.   **(06 Marks)**
 b. Obtain an expression for maximum effective aperture of a short – dipole and show its directivity is 1.5.   **(08 Marks)**
 c. A low frequency transmitting antenna has a $R_r = 0.5\Omega$ and total los resistance of 2.5Ω. If the current fed to antenna is 100A, calculate the power radiated, input power and antenna efficiency.   **(06 Marks)**

2 a. State and prove "Power theorem".   **(06 Marks)**
 b. Obtain directivity of a source given by
$$u = u_m \cos^2\theta \quad 0 \le \theta \le \pi/2$$
$$0 \le \phi \le 2\pi .$$ **(08 Marks)**
 c. An end five array consisting of isotropic radiators is to have a directive gain of 30.
   i) Find array length and BWFN   ii) Find the above for the broadside array.   **(06 Marks)**

3 a. Obtain an expression for radiation resistance of a short dipole.   **(08 Marks)**
 b. Draw a typical microstrip antenna and explain its working. Give 3 applications of microstrip antenna.   **(06 Marks)**
 c. Explain the construction of a folded dipole element antenna and working principles. **(06 Marks)**

4 a. With suitable diagram, obtain the expressions for $E\phi$ and $H\theta$, the far field components of a small loop.   **(10 Marks)**
 b. Explain the construction and working of a slot antenna.   **(06 Marks)**
 c. A loop aerial operating at 500KHz, is of height 0.5m, width 0.5m and 25 turns. The emf induced in the loop is 150µV. When the system is directed to receive maximum signal. Calculate the field strength of the received signal.   **(04 Marks)**

5 a. Give the construction of a E-H born antenna and explain its working by giving proper design equations.   **(10 Marks)**
 b. What are frequency independent antennas? Explain with construction, the working of a log-periodic antenna.   **(06 Marks)**
 c. A 64m diameter dish antenna, operating at a frequency of 1.43GHz is fed by a non directional antenna. Calculate its i) HPBW ii) BWFN iii) Gain with reference to $\lambda/2$ dipole. **(04 Marks)**

6 a. Write short notes on : i) Embedded antennas   ii) Plasma antennas   **(12 Marks)**
 b. Draw the ray diagram for a dielectric lens antenna and obtain the equation for radius of curvature 'R'.   **(08 Marks)**

7 a. Derive an expression for tilt angle of ground wave propagation.   **(08 Marks)**
 b. Obtain an expression for field strength due to space wave propagation.   **(08 Marks)**
 c. A TV transmitting antenna a mounted at a height of 120mt radiates 15KW of power at a frequency of 50MHz. Calculate : i) Maximum line – of – right range ii) Field strength at receiving antenna. For $h_r = 16$mts at a distance of 12km.   **(04 Marks)**

8 a. Discuss various layers of ionosphere showing electron density variation.   **(08 Marks)**
 b. Define and explain the terms : i) MUF   ii) Skip distance.   **(08 Marks)**
 c. For a flat earth, assume that at 400km reflection takes place. the maximum density corresponds to a refractive index of 0.9 at 10MHz. Calculate range for which $f_{muf} = 10$MHz. **(04 Marks)**

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